PENDING CLAIMS

Claims 1, 3-8 and 10 have been amended as follows:

1. (Currently amended) A photodiode, comprising:

a substrate;

a first conduction type buffer layer formed on a first surface of the substrate;

an amplifying layer ~~having a superlattice structure~~ formed on the first conduction type buffer layer ~~to form a mesa structure~~;

a second conduction type field controlling layer formed on the amplifying layer;

a second conduction type ion injection layer formed within the field controlling layer;

a second conduction type light-absorbing layer formed on the field controlling layer;

a second conduction type buffer layer formed on the light-absorbing layer; and

a first electrode and a second electrode formed to electrically contact the first conduction type buffer layer and the second conduction type buffer layer, respectively.

2. (Original) The photodiode according to claim 1, further comprising a second conduction type ohmic contact layer formed between the second condcution type buffer layer and the second electrode.

3. (Currently amended) The photodiode according to claim 2, further comprising a passivation layer ~~formed on an entire surface of the substrate including~~ covering a surface of the second conduction type ohmic contact layer and a surface of the first conduction type buffer layer, while allowing ~~, wherein the passivation layer comprises a plurality of contact holes enabling~~ the first electrode to electrically contact the first conduction type buffer layer and the second electrode to electrically contact the second conduction type ohmic contact layer.

4. (Currently amended) The photodiode according to claim 1, further comprising an anti-reflection layer formed on a second ~~lower~~ surface of the substrate which faces away from the first conduction type buffer layer.

5. (Currently amended) The photodiode according to claim 1, wherein each of the first conduction type buffer layer, the second conduction type field controlling layer, and the second conduction type buffer layer comprises ~~are formed of~~ an InP semiconductor layer, and wherein the second conduction type light-absorbing layer comprises ~~is formed of~~ an InGaAs semiconductor layer.

6. (Currently amended) The photodiode according to claim 1, wherein the first conduction type buffer layer comprises an ~~is formed of the~~ InP semiconductor layer and an InAlAs semiconductor layer.

7. (Currently amended) The photodiode according to claim 1, wherein a total charge density of the second conduction type ion injection layer and the second conduction type field controlling layer is $3\times1012/cm^2\pm20\%$, and wherein a charge density of ~~an edge region, a~~ region of the second conduction type filed controlling layer where the second conduction type ion injection layer is not formed~~,~~ is $2\times1012/cm^2\pm20\%$.

8. (Currently amended) The photodiode according to claim 1, wherein the amplifying layer comprises at least ~~having the superlattice structure is either formed of~~ one of the InAlAs semiconductor layer and an InAlGaAs semiconductor layer~~, or formed of the InAlAs semiconductor layer and the InAlGaAs semiconductor layer alternately deposited on each other~~.

9. (Original) The photodiode according to claim 1, wherein the second electrode is formed in a ring structure so as to project a plurality of optical signals toward the second electrode.

10. (Currently amended) The photodiode according to claim 1, wherein the substrate ~~is formed of~~ comprises one of a first conduction type InP semiconductor layer and a semi-insulation InP semiconductor layer.

11. (Withdrawn) A method for fabricating a photodiode, comprising:

preparing a substrate;

serially forming a first conduction type buffer layer, an amplifying layer having a superlattice structure, a second conduction type field controlling layer, and a surface protection layer on the substrate;

injecting ions into the field controlling layer so as to form a second conduction type ion injection layer;

removing the surface protection layer and serially forming a second conduction type light-absorbing layer, a second conduction type field buffer layer, and a second conduction type ohmic contact layer on the field controlling layer;

selectively removing the second conduction type ohmic contact layer, the second conduction type field buffer layer, the second conduction type light-absorbing layer, the second conduction type field controlling layer, and the amplifying layer having the

superlattice structure, based on the ion injection layer, so as to expose a surface of the first conduction type buffer layer, thereby forming a mesa structure;

forming a passivation layer on an entire surface of the substrate, so as to form a plurality of contact holes on the ohmic contact layer and the first conduction type buffer layer; and

forming a first electrode and a second electrode electrically contacting the first conduction type buffer layer and the second conduction type ohmic contact layer, respectively, through the contact holes.

12. (Withdrawn) The method according to claim 11, wherein the forming an ion injection layer further comprises:

ion injecting impurities such as beryllium (Be) or magnesium (Mg) into the field controlling layer; and

activating the injected ions by treating the substrate with a heating process.

13. (Withdrawn) The method according to claim 12, wherein the heating process is carried out at a temperature in the range of 600 to 700 degrees Celsius (°C).

14. (Withdrawn) The method according to claim 11, further comprising carrying out a lapping process and a polishing process, so as to reduce a thickness of the photodiode.

15. (Withdrawn) The method according to claim 11, further comprising forming an anti-reflection layer on a lower surface of the substrate.

16. (Withdrawn) The method according to claim 11, wherein the first conduction type buffer layer, the second conduction type field controlling layer, and the second conduction type buffer layer are formed of an InP semiconductor layer, and the second conduction type light-absorbing layer and the second conduction type ohmic contact layer are formed of an InGaAs semiconductor layer.

17. (Withdrawn) The method according to claim 11, wherein the first conductive type buffer layer is formed by depositing the InP semiconductor layer and an InAlAs semiconductor layer, and the InAlAs semiconductor layer is removed when forming the mesa structure.

18. (Withdrawn) The method according to claim 11, wherein a total charge density of the second conduction type ion injection layer and the second conduction type field controlling

layer is less than or equal to $3\times1012/cm^2\pm20\%$, and a charge density of an edge region, where the ion injection layer is not formed, is $2\times1012/cm^2\pm20\%$.

19. (Withdrawn) The method according to claim 11, wherein the amplifying layer having the superlattice structure is either formed of one of the InAlAs semiconductor layer and an InAlGaAs semiconductor layer, or formed of the InAlAs semiconductor layer and the InAlGaAs semiconductor layer alternately deposited on each other.

20. (Withdrawn) A method for fabricating a photodiode, comprising:

preparing a substrate;

serially forming a first conduction type buffer layer, an amplifying layer having a superlattice structure, a second conduction type field controlling layer, a second conduction type light-absorbing layer, a second conduction type field buffer layer, and a second conduction type ohmic contact layer on the substrate;

injecting ions into the field controlling layer so as to form a second conduction type ion injection layer;

selectively removing the second conduction type ohmic contact layer, the second conduction type field buffer layer, the second conduction type light-absorbing layer, the second based on the ion injection layer, conduction type field controlling layer, and the amplifying layer having the superlattice structure, so as to expose a surface of the first conduction type buffer layer, thereby forming a mesa structure;

forming a passivation layer on an entire surface of the substrate, so as to form a plurality of contact holes on the ohmic contact layer and the first conduction type buffer layer; and

forming a first electrode and a second electrode electrically contacting the first conduction type buffer layer and the second conduction type ohmic contact layer, respectively, through the contact holes.

21. (Withdrawn) The method according to claim 20, further comprising forming an anti-reflection layer on a lower surface of the substrate.

22. (Withdrawn) The method according to claim 20, wherein the first conduction type buffer layer, the second conduction type field controlling layer, and the second conduction type buffer layer are formed of an InP semiconductor layer, and the second conduction type light-

absorbing layer and the second conduction type ohmic contact layer are formed of an InGaAs semiconductor layer.

23. (Withdrawn) The method according to claim 20, wherein the first conductive type buffer layer is formed by depositing the InP semiconductor layer and an InAlAs semiconductor layer, and the InAlAs semiconductor layer is removed when forming the mesa structure.

24. (Withdrawn) The method according to claim 20, wherein a total charge density of the second conduction type ion injection layer and the second conduction type field controlling layer is less than or equal to $3 \times 1012/cm^2 \pm 20\%$, and a charge density of an edge region, where the ion injection layer is not formed, is $2 \times 1012/cm^2 \pm 20\%$.

25. (Withdrawn) The method according to claim 20, wherein the amplifying layer having the superlattice structure is either formed of one of the InAlAs semiconductor layer and an InAlGaAs semiconductor layer, or formed of the InAlAs semiconductor layer and the InAlGaAs semiconductor layer alternately deposited on each other.